

Name: _____

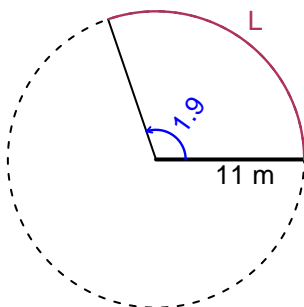
Date: _____

Trig Final (SLTN v642)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.9 radians. The radius is 11 meters. How long is the arc in meters?

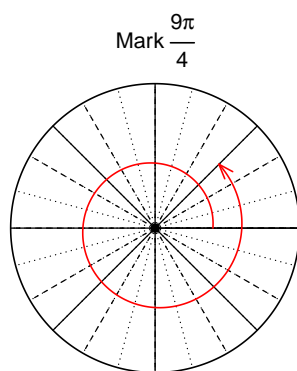


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 20.9$ meters.

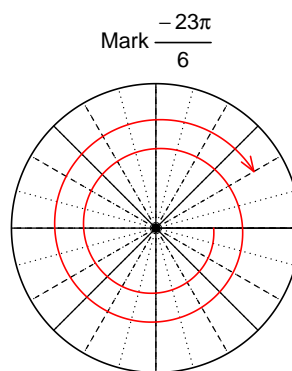
Question 2

Consider angles $\frac{9\pi}{4}$ and $-\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(-\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(9\pi/4)$

$$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$$



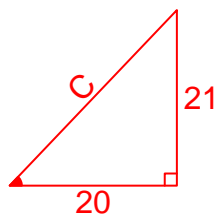
Find $\cos(-23\pi/6)$

$$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$$

Question 3

If $\tan(\theta) = \frac{-21}{20}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

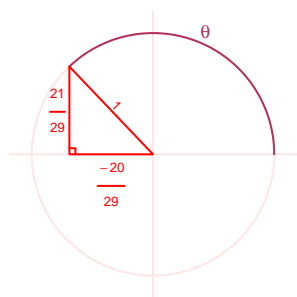
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}20^2 + 21^2 &= C^2 \\ C &= \sqrt{20^2 + 21^2} \\ C &= 29\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.62 Hz, a midline at $y = -2.3$ meters, and an amplitude of 6.49 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.49 \sin(2\pi 7.62t) - 2.3$$

or

$$y = -6.49 \sin(15.24\pi t) - 2.3$$

or

$$y = -6.49 \sin(47.88t) - 2.3$$